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ABSTRACT

This document contains 12 outlines that forecast the office of the future. The outlines cover the following topics: (1) office automation definition and objectives; (2) functional categories of office automation software packages for mini and mainframe computers; (3) office automation-related software for microcomputers; (4) office automation architecture top-down design; (5) office automation architecture bottom-up design; (6) office automation architecture departmental design; (7) telecommunications--wide area networks; (8) a sampling of public databases; (9) electronic mail/message/voice systems; (10) electronic document-based filing systems; (11) a comparison of optical disk technologies for office automation applications; and (12) the office in the year 2000. Most outlines are one to two pages in length. (KC)

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WORKSHOP ON
OFFICE AUTOMATION AND TELECOMMUNICATION:
APPLYING THE TECHNOLOGY

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TABLE OF CONTENTS

Office Automation Definition and Objectives 1

Functional Categories of Office Automation Software Packages for Mini and Mainframe Computers 2

Office Automation Related Software for Microcomputers 3

Office Automation Architecture Top Down Design 5

Office Automation Architecture Bottom-Up Design 6

Office Automation Architecture Departmental Design 8

Telecommunications--Wide Area Networks 10

A Sampling of Public Data Bases 17

Electronic Mail/Message/Voice Systems 20

Electronic Document Based Filing Systems 24

A Comparison of Optical Disk Technologies for Office Automation Applications 26

The Office in the Year 2000 31

Office Automation Definitions and Objectives

Office Automation is:

I. The electronic integration and communication of the information processes (voice, data, word, image, video).

II. A program designed to improve the efficiency and effectiveness of business communications through the integration of people, procedures, electronic office equipment, and telecommunications technology into an organized and managed system.

III. People using technology to manage and communicate information more effectively.

IV. The careful integration of technology with improved office processes to increase the productivity and effectiveness of all office workers--management, professionals, secretaries, and clerks.

NOTE: OA must never be considered solely as acquiring new technology. Equipment can only help improve the efficiency of the operation--it is much more important to be effective in doing the right things, than to be efficient doing the wrong things.

Objectives of Office Automation

I. Increase the productivity of managers and professionals

II. Provide more responsive administrative support at all levels

III. Upgrade the quality and quantity of document/information output

IV. Increase the speed of communicating information between sender and receiver(s)

V. Reduce costs of office operations

VI. Improve internal and external oral and written communications

VII. Electronically integrate the information processes

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Functional Categories of Office Automation Software Packages For Mini and Mainframe Computers

I. Communications
   - A. Electronic mail
   - B. Voice mail
   - C. Access to public data bases

II. Information Retrieval
   - A. Document based management (filing) system
   - B. Organizational data base

III. Analytical Tools
   - A. Spread sheet applications
   - B. Calculator functions
   - C. Graphics (selected packages)

IV. Text Processing
   - A. Word processing
   - B. Mail/merge functions
   - C. Sort functions
   - D. Spelling verification
   - E. Forms/report generation (selected packages)
   - F. Automatic hyphenation (selected packages)

V. Personal Support Tools
   - A. Schedulers
   - B. Calendars
   - C. To do/did lists
   - D. Ticklers

VI. Special Applications and Programmability
   - A. Accounting/data processing functions
   - B. Decision support functions
   - C. System security and user access
   - D. User ability to develop programs for special functions

NOTE: Sampling of OA software packages for mini/mainframe computers:

- AT&T: Dimension 75/85
- DG : CEO
- DEC : All-in-One
- HP : Desk Manager
- IBM : Profs
- WANG: Office

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Office Automation Related Software
For Microcomputers

I. Integrated Software
   A. Incorporates ability for multi-functional activities within the package
   B. Sampling of integrated software

PACKAGE	WP	SS	GR	DB	TE	Other	Cost*
Ability	X	X	X	X	X		$495
Corporate MBA	X	X	X	X	X	EM Wi	$695
Enable	X	X	X	X	X	Wi	$695
Framework	X	X	X	X	X	FP OG Wi	$695
Open Access II	X	X	X	X	X	TM Wi	$595
Smart System	X	X	X	X	X	TM Wi	$895
Symphony	X	X	X	X	X	Wi	$695

EM = Terminal Emulation
Wi = Windows
FP = Forms Processor
OG = Outline Generator
TM = Time Management

* The costs shown are list prices for packages used in a standalone environment. Networked version will be higher; e.g. the networkable package "Smart System" lists for $1,995 in a 3 terminal environment.

II. Integrator Software (Integration Interfaces)
   A. User accesses output from other software packages
   B. Requires hard disk storage
   C. Sampling of integrator software
      1. DesQ (Quarterdeck)
      2. GEM (Digital Research)
      3. Topview (IBM)
      4. Windows (Microsoft)

III. Sampling of Software Vendors and Their Product Line
   A. Ashton-Tate
      1. dBase II & dBase III
      2. Framework
      3. Multimate (Ashton-Tate purchased Multimate International in 1985)

B. Digital Research
   1. Concurrent DOS operating system
   2. CP/M operating system
   3. GEM

C. Lotus Development Corporation
   1. Jazz
   2. Lotus 1-2-3
   3. Symphony

D. Micropro International
   1. Calcstar
   2. Easy
   3. Spellstar
   4. Starburst (forms generator)
   5. Wordstar and Wordstar 2000

E. Microsoft Corporation
   1. Basic
   2. MS DOS, Xenix operating systems
   3. Multiplan
   4. Project (planning software)
   5. Windows
   6. Word

F. Software Publishing
   1. pfs:File
   2. pfs:Report
   3. pfs:Write

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Office Automation Architecture
Top-Down Design

I. OA Software Installed on Computer (Mini/Mainframe)
   A. Computer initially acquired for DP functions
   B. Information processing functions integrated via OA software
      1. Data processing
      2. Word processing
      3. Document distribution
      4. Electronic mail/messaging
      5. Electronic filing
      6. Data base access
      7. Calendaring/scheduling

II. Advantages of the Top-Down Design
   A. Computer system already in place
   B. Possible to implement OA with minimal investment in hardware

III. Shortcomings of the Top-Down Design
   A. Additional time required to implement OA -- e.g. system security
   B. Comprehensive OA software not available on all mainframes
   C. Degradation of system response time as more terminals and functions are implemented
   D. Training for OA applications complicated by system security, locating the appropriate application software module, and dedication to DP functions

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Office Automation Architecture
Bottom-up Design

I. Work Station Level
   A. Select most critical problem(s) to be solved
   B. Identify software available to address problems
   C. Examples of problem areas addressed by "off-the-shelf" software
      1. Word processing
      2. Personal computing
      3. Personal filing
      4. Personal management
   D. Standardize on operating system and minimum hardware components
   E. Install and implement the work station

II. Information Systems Integration Level
   A. Proceed with the steps to link the system
   B. Areas to be addressed at the system level
      1. Electronic mail
      2. Electronic filing
      3. Document and information sharing
      4. Device sharing
      5. Communication gateways
      6. Enhancement of internal support
   C. Networking addressed at this level
      1. Office automation software for mini/mainframe based systems or networked integrated/integrator software for microcomputer based networks
      2. Hardware alternatives to drive the system
         a. Existing work station with additional RAM memory and hard disk/card
         b. Minicomputer
         c. Controller with file server
      3. Communication software
      4. Communication link alternatives
         a. PBX/Modems
         b. LAN
         c. Combination PBX and LAN
   D. Select software, hardware, and communication link
   E. Install and implement the system

III. Total Systems Integration Level
   A. Proceed with the steps to expand the network
   B. Areas to be addressed at the information systems level
      1. Access to distributed computer systems
         a. Other departmental data bases
         b. Organizational data bases
         c. Public data bases
      2. Office automation software on the mainframe
      3. Expansion of the features identified in level 2
   C. Mainframe is connected to the network

IV. Advantages of the Bottom-up Design
- A. User oriented from the beginning
- B. Much easier to sell to the staff
- C. Faster implementation
- D. Lower entry level costs for hardware
- E. Training costs minimized
- F. Problem areas addressed immediately

V. Shortcomings of the Bottom-up Design
- A. Many organizations are beyond the work station level and have a variety of microcomputers that are not compatible
- B. Requires additional software costs prior to networking
- C. All applications software is not networkable
- D. LAN software has not reached the same level of maturity as mini/mainframe software

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Office Automation Architecture
Departmental Design

I. Equipment Setting
   A. Mainframe used for DP functions
   B. Proliferation of microcomputers for "specific" functions
   C. Micro to mainframe link may not be realistic

II. Acquire Minicomputer System(s) with OA Software on a Departmental or Other Unit Basis for:
   A. Communications
      1. Electronic Mail/Voice Mail
      2. Public data base access
      3. Document distribution
   B. Information retrieval
      1. Document based management (filing) systems
      2. Departmental data base
   C. Analytical tools
      1. Spread sheet applications
      2. Calculation
   D. Word Processing
      1. Editing
      2. Mail/merge functions
      3. Sorting
      4. Spelling verification
   E. Personal support tools
      1. Calendars
      2. Schedulers
      3. Ticklers
   F. Special functions
      1. Security
      2. Programming tools

III. Link OA System to Mainframe Via Software for:
   A. Access to organizational data base
   B. Increase system scope
      1. Document distribution
      2. Electronic mail
      3. Data base access

IV. Bring Microcomputers into the OA System as Terminals on the "Departmental" Minicomputer

V. Advantages of the Departmental Design
   A. May be the only realistic alternative
   B. Immediate access to OA applications
   C. Proven hardware and software already on the market
   D. Software designed for the occasional user
   E. Mainframe link and microcomputer phase is approached on an "as needed" basis

VI. Shortcomings of the Departmental Design
   A. Equipment duplication
   B. Substantial initial investment

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Telecommunications--Wide Area Networks

I. Definitions
   A. Telecommunications is any transmission or reception of signals, writing, sounds, by wire, radio, visual, or electromagnetic systems
   B. Wide area networks are designed to interface voice, video, fax, data communications and teleconferencing capabilities

II. Advantages of Wide Area Network Systems (sometimes called Value Added Networks)
   A. Facilitate the flow of information
   B. Allow different people to interact
   C. Provide value added services
      1. Electronic mail/message/voice systems
      2. Store and forward alternatives
      3. Alternative types of telecommunication (message switching, packet switching)
      4. Data integrity

III. Transmission Background Information
   A. Switched (dial-up) analog service over telephone lines is generally limited to 9,600 bps
   B. Leased (dedicated) line analog service is essentially limited to 19,200 bps
   C. Switched (dial-up) and leased digital line service where available is 56,000 bps
   D. To maximize leased line service, multiplexers and/or concentrators are used so that two or more devices share the same line
   E. T1 digital service, now available to end users, transmits at 1.544 Mbps
   F. Packet switching, where a message is divided into smaller "blocks" and the "blocks" are then transmitted over alternate routes and assembled in the right order at their destination, is generally faster and more economical than sending a message in total over a switched line

IV. Partial List of Wide Area Networks
   A. CYLIX--RCA Communication Network
   B. ITT World Communications, Inc.
   C. SBS (Satellite Business System)--IBM, COMSAT General Corporation and Aetna Life and Casualty)
   D. SKYNET--AT&T
   E. SPRINT--GTE Communications Corporation
   F. TELENET--GTE Communications Corporation
   G. TYMNET--Tymshare, Inc.

V. Background Characteristics of Wide Area Networks
   A. CYLIX--RCA Communication Network
      1. Primary market--small to medium users
      2. Satellite based with a primary and backup satellite
      3. Hierarchial star network

4. Packet switching network, non-voice lines
5. Thirty earth stations linked to Memphis control center
6. 100,000 miles of land lines leased from AT&T
7. Transmission speed is 9,600 bps
8. Electronic mail capability
9. Installation charge--$900, $1,000 month host computer connection fee, $345 remote location connection fee per month
10. Address:
    800 Ridge Lake Boulevard
    Memphis, TN 38119-9404
    (901) 761-1177

B. ITT World Communications (International Telephone/Telegraph)
1. Primary market--large organizations with nationwide and worldwide communication needs
2. Emphasis on voice, data, record services
3. Timetran (store and forward message service), ARX (Automatic Retransmission Exchange), Dedicated Circuits, Databridge (protocol conversion), UDTS (Universal Data Transfer Service), Infotex (packet switching service), and FAXPAK (computerized facsimile service) represent a sampling of ITT's value added features
4. Services that ITT is adding include electronic mail, video teleconferencing, and enhanced facsimile services
5. Dial-up access speeds from 50 bps to 4800 bps with dedicated circuits up to 56K bps are accommodated.
6. All codes from Baudot to ASCII and EBCDIC plus latest protocols to include 3780 and 3270 (bisynchronous and X.25 packet switching are acceptable)
7. Installation charges depend on service desired
8. Address:
    ITT World Communications, Inc.
    67 Broad Street
    New York, NY 10004
    (800) 424-1170

C. SBS (Satellite Business System)--IBM, COMSAT General Corporation, and Aetna Life and Casualty
1. Primary market--large organizations
2. Emphasis on private networks for voice, data, and image applications
3. Services used for intracompany data communications, electronic document distribution, video teleconferencing
4. Attractive for intracompany communications traffic throughout the United States
5. CNS (Communications Network Service) is divided into CNS-A for high-volume users with dedicated earth stations and CNS-B for low-volume users with shared earth stations
6. Message Service I is for switched, interstate voice communications service for large business uers; Message Service II is for residential and small business users

7. Monthly charges are $6,650-$17,850 for using dedicated earth station, $2,400-$2,550 for full-time transmission, 24 hours a day, 7 days a week, $2,250 for full business day transmission
8. Installation charge is $1,000 each plus $13 per foot
9. Address:

   Satellite Business Systems
   8283 Greensboro Drive
   McLean, Virginia 22102
   (703) 442-5000

D. SKYNET--AT&T
1. Primary market--customers who require dedicated communication links
2. Dedicated communication link for voice, video, data communications, and facsimile transmission
3. Simplex, half-duplex, and full-duplex transmission is available
4. Dedicated, high capacity, data transmission service via satellite between shared or dedicated earth stations
5. Space segments cost $18,000 per month. Shared systems cost $1,500-$3,500 per month plus $2,000 per shared terminal. Dedicated systems cost $13,000-$15,000 plus $90,000. There also is a one time termination charge of $53,000-$62,000.
6. Address:

   AT&T Communications
   Badminster, NJ 07921
   (201) 234-4000

E. SPRINT--GTE Communications Corporation
1. Primary market--business use, inter-city communications of various bandwidths and data speeds
2. Microwave radio relay system which allows for transmission of voice, data, facsimile, telemetering, control, and alarm features
3. User can design a "custom package"
4. Primary advantage is cost, $70-$100 per month access port, minimum usage is $250
5. Address:

   GTE Sprint
   Minneapolis, MN
   (612) 333-2336

F. TELENET--GTE Communications Corporation
1. Primary market--public network
2. Consists of switching and network-access centers, transmission facilities leased from other common carriers, a network control center, and network-access
3. Private data network system also available to corporations and government agencies
4. Packet switching
5. Access through dial-in ports, private dial ports, and dedicated facilities
6. Available in all 50 states and foreign countries
7. Used for economical remote access to in-house time sharing, text editing, management information, and message processing

8. Priced according to use, ranging from $260 to $1,400 per month
9. Address:
   GTE Telenet Communications Corporation
   8229 Boone Boulevard
   Vienna, VA 22180
   (800) TELENET

G. TYMNET--Tymshare, Inc.
1. Primary market--large corporations
2. Transmits only data communications, popular uses are electronic mail and messaging
3. Geared to low speed users--lower initial start up--use phone-line or dial-in entry
4. 384,093 miles of leased lines, used by more than 4,000 simultaneous terminal users
5. Value added common carrier
6. Costs are based on the length of time users are on the network, number of characters sent, and the number of messages sent
7. Claims to be the world's largest, most powerful, and most sophisticated public packet network
8. Typical coast-to-coast message costs about 50¢ to 75¢
9. Address:
   Tymnet, Inc.
   2710 Orchard Parkway
   San Jose, CA 05134
   (800) 227-6185

VI. Electronic Mail/Message/Voice Systems via Wide Area Networks
A. EasyLink--Western Union
1. Primary market--businesses of all sizes
2. Access to Western Union's computer via telephone
3. Data of introduction--1982
4. A computer based message system accessed by a multi-function terminal at user's site
5. No installation or start-up cost required
6. Includes access to the worldwide Telex network
7. Messages can be sent internally or anywhere in the world
8. Terminals can be any microcomputer word processor, or other electronic devices--no compatibility problem
9. Address:
   EasyLink Instant Mail Service
   P. O. Box 37472
   Omaha, NE 68137
   (800) 445-4444

B. FAXPAX--ITT
1. Primary market--business
2. Wide-band facsimile network
3. High speed transmission
4. Packet switching, store and forward capabilities
5. Access via analog or digital private lines or public dial-up lines

6. 300 baud ASCII data terminals
7. Deliveries can be made at any time regardless of terminals being busy or unattended, around the clock, seven days a week
8. Service is priced per minute on a delivery priority basis
9. Evening rates are 35¢ per minute, day rates are 40¢ per minute
10. Address:

    Director of Marketing
    ITT World Communications, Inc.
    100 Plaza Drive
    Secaucus, NJ 07096

C. MCI Mail--MCI Communications Corporation
1. Primary market--business
2. Computer-based message system (CBMS)
3. 14,500 mile cross-country network of lines
4. 15 MCI "post offices" throughout the United States
5. No minimum message requirements
6. Twenty-four satellite transponders
7. $1.00 per document fee, message is stored in MCI's mailbox until recipient's terminal accepts it or is delivered as hard copy as specified by user
8. Deliver 4 page document within 4 hours for $25.00, overnight by noon--$6.00, first class--$2.00
9. Access by local phone or through a toll-free number
10. Address:

    MCI Communications Corporation
    1133 19th Street NW
    Washington, DC 20036
    (202) 872-1600

D. ROLM PhoneMail System
1. Primary market--small and large businesses
2. Computer-based voice communications (CBVC) system
3. Access by local phone
4. Introduced in December, 1982
5. Transmits voice and data--synchronous or asynchronous--simultaneously over telephone wires
6. Can transmit at speeds up to 56Kbps
7. Message length, minimum--5 sec/min to maximum--varies
8. Purchase price--$70,000 to $185,000 (includes hardware and software)
9. Maintenance--$510-$1400/month
10. Features:
    a. Telephone answering
    b. Message notification
    c. Voice mailbox
    d. Message forwarding
    e. Message distribution
11. ROLM CBX is the hub of PhoneMail
    a. Asychronous only
    b. Speeds of 110-10,200 bps
    c. Full duplex
    d. Interface uses RS-232C cable

12. Address:
    ROLM Corporation
    Office Systems Division
    4900 Old Ironsides Drive
    Santa Clara, CA 95050
    (408) 988-2900

E. TELEX--Western Union (Being replaced by EasyLink)
1. Primary market--public and business
2. Telephone line transmission
3. Store and forward message service available
4. Local access available in over 1640 exchange cities at a monthly flat rate
5. Costs 34¢ per minute, access line charges are $34-$44 per month
6. International teletypewriter service
7. Address:
    Western Union
    1 Lake Street
    Upper Saddle River, NJ 07458

F. TWX--Western Union (Being replaced by EasyLink)
1. Primary market--public and business
2. Message and data oriented
3. Domestic teletypewriter service
4. Access by leased line from customer premise
5. Costs 43¢ per minute, access line charges are $34-$44 per month
6. Address:
    Western Union
    1 Lake Street
    Upper Saddle River, NJ 07458

G. VMX, Inc.--Voice Message Exchange
1. Primary market--business
2. Computer-based voice communications (CBVC) system
3. Access by any telephone including WATS & PBX
4. Date of introduction--1980
5. Standard storage capacity--1200 MB--for maximum system
6. Voice storage capacity--82 hours--for maximum system
7. User capacity--1,000-8,000--depending upon system
8. Number of access lines depends upon system. The smallest system has 16; the largest system has 64. Can be networked.
9. Messages can be played up to three times.
10. Message length depends upon system configuration.
11. Basic functions: SEND, RECEIVE, REPLY, REDIRECT, BROADCAST
12. Pricing
    a. Purchase $195,000-$525,000
    b. Lease $40/month for minimum amount of 25 boxes and 800 calls
    c. Maintenance $25,000-$30,000 per year
13. Address:
    VMX, Inc.
    1214 Columbia Drive
    Richardson, TX 75081
    (214) 699-1461

H. WINC (Worldwide Integrated Communications Service) from Mohawk Data Sciences
   1. Primary market--medium to large businesses
   2. Computer based message system (CBMS)
   3. Two levels of desk-top terminals
      a. $6,000 Messenger--dedicated terminal with a built-in modem
      b. $10,000 Series 21--includes extensive data and word processing features
   4. Options available
      a. Automatic Mail--an automated collection and distribution service
      b. Mail Drop--which allows any communicating terminal to access all other WINC terminals and services
      c. Direct Delivery--which automatically delivers messages to any communicating terminal that has an automatic answering device
   5. Every 15 to 90 minutes, Mohawk's center polls each terminal on the network for messages
   6. No message length restriction; however, 35,000 characters is recommended
   7. Messages may be sent to individuals, groups, or self
   8. Outside services accessed are Telex I, Telex II, International WINC Service, IRC, and British Telecom
   9. Compatible with other terminals including Wang and IBM
   10. Transfer of messages from terminal to terminal within the same building without having to go through Mohawk's network
   11. Subscription fee ranges from $20 to $200 per month per terminal plus usage. Probably will represent a 20% cost savings over Western Union's InfoCom
   12. Address:
       Mohawk Data Sciences
       Wilton, Connecticut

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A Sampling of Public Data Bases

I. Background
   A. There are well over a thousand on-line telecommunication vendors in the U.S.
   B. Some are gigantic utilities offering vast libraries of data
   C. Most are modest bulletin board systems
   D. The big three on-line companies marketing information, communications, entertainment, and a variety of other services are:
      1. CompuServe
      2. The Source
      3. Dow Jones News Retrieval Service

II. CompuServe
   A. Parent Company: H & R Block
   B. Over 110,000 subscribers
   C. Offer more than 1,400 services and features
   D. Major offerings
      1. Special interest groups--more than 50 electronic "clubs" get together on-line and exchange information on anything and everything
      2. Interactive games
         a. Megawars
         b. Adventure
         c. Space wars
      3. Encyclopedias
         a. Grolier's Academic American--9 million word data base with over 29,000 subjects
         b. World Block Encyclopedia--10 million word data base with 31,000 subjects
      4. CB Simulator
         a. A computer with about 40 channels
         b. Subscribers "chat" just like CB users
      5. College Board Advisor
         a. On-line advice about selecting a college
         b. On-line advice about preparing for the Scholastic Aptitude Test
      6. Shopping Services
         a. Comp-U-Store
         b. 60,000 brand-name items
      7. Business Services
         a. Information on 9,000 securities updated every 20 minutes
         b. Information on 40,000 stocks
      8. Information on Demand
         a. Information on products, places, things
         b. Access to professional research services
   E. Cost
      1. Registration fee $39.50--customers can sign up at local Radio Shack stores for only $29.95
      2. $12.50 per hour peak rate (5 a.m. to 6 p.m.)
      3. $6.50 per hour off-peak rate (6 p.m. to 5 a.m.)

III. The Source
- A. Parent Company: Reader's Digest Association, Inc.
- B. Over 60,000 subscribers
- C. Offer more than 1,200 services and features
- D. Major offerings
  1. Electronic Mail
     - a. Each subscriber has a mailbox
     - b. Letters may be sent, read, and filed in an on-line storage area--faster and usually cheaper than long-distance telephone, express delivery, or facsimile
  2. Computer Conferencing
     - a. Conferences can include from 2 to 200 participants
     - b. Conferences can be started by anyone on the system
  3. Electronic Bulletin Boards
  4. Chat--like CB use
  5. News and sports
     - a. Associated Press Videotext service provides 250 daily dispatches on news, weather, and sports
     - b. Subscribers can search by keyword on the progress of bills in Congress
  6. Shopping Services
     - a. Comp-U-Store
     - b. 60,000 brand-name items
  7. Retrieval and Research
     - a. Electronically order any book in print
     - b. Summaries from 27 leading business publications such as Forbes, Venture, Harvard Business Review
- E. Cost
  1. Registration $100
  2. $20.75 per hour peak rate
  3. $7.75 per hour off-peak rate for evenings and weekends
  4. Call 1 (800) 336-3366 for subscription forms

IV. Dow Jones News/Retrieval
- A. Parent Company: Dow Jones
- B. Over 150,000 subscribers
- C. Major offerings
  1. Access to 26 huge data bases in 3 categories
     - a. Business and Economic news
     - b. Financial and Investment services--Dow Jones quotes
     - c. General news and information
  2. Encyclopedia--Academic American Encyclopedia
  3. News, weather, sports
  4. Shopping Services
     - a. Comp-U-Store
     - b. 60,000 brand-name items
  5. On-line reports--90 seconds old
     - a. Wall Street Journal
     - b. Barron's
     - c. Dow Jones News Service

D. Cost
   1. Standard subscription fee is $75
   2. $72 per hour peak rate
   3. $54 per hour off-peak rate (6 p.m. - 6 a.m. weekdays and all day on weekends)
   4. Call 1 (800) 257-5114 for subscription forms

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Electronic Mail/Message/Voice Systems

I. Categories of electronic mail/message systems
   A. Facsimile systems (FAX)--long distance dumb copier; transmits everything on page--words, pictures, graphics, signatures
   B. Communicating word processors (CWP)--document transmission between word processors (letters, memos, reports, messages)
   C. Computer-based message systems (CBMS)--alternative to telephone; message transmission to a display terminal
   D. *Computer-based voice communications (CBVC)--alternative to keyboard; voice message stored in electronic mailbox accessed by telephone

      *CBVC is not classified as an electronic mail/message system by some individuals since it involves voice input/output as opposed to keyboard originated input/output.

II. Facsimile (FAX)
   A. Entered in the 1960's
   B. Transmits everything on page
   C. Information sent to compatible terminals only
   D. First machines were analog fax units; todays are digital fax which lends itself to computer control
   E. Categories of fax units
      1. Group 1
         a. 4-6 minutes to transmit page
         b. Approximately 105,000 units installed--largest & oldest group
         c. Growth rate of this group declining
         d. Over 60 documents a month and Group 1 fax units are not cost justifiable
      2. Group 2
         a. 2-3 minute transmission per page
         b. Growing at much faster rate than Group 1 machines
         c. Suited for moderately heavy operations up to 200 documents a month
      3. Group 3 and 4
         a. One minute or less transmission time
         b. Volume must be in excess of 300 documents a month to be cost justifiable
         c. Most technological emphasis on fax machines within this group
         d. Group 4 machines transmit digitally and can be linked to a computer
         e. Prime candidate for use in electronic mail systems that transmit fax or messages
   F. Importance of computer controlled facsimile transmission
      1. Before computer control, facsimile transmitted on deferred basis only
      2. Transmitted via an electronic feed device that could be preset for sometime after the working day

3. System not foolproof--problems at night not solved until next day
4. Documents can be faxed over voice grade telephone lines on a real time basis; however, this cuts into valuable work time during the day.
5. Increased costs for toll charges on day time transmission.

G. With computer controlled fax, users have
1. Store and forward capabilities
2. Functions with/without keyboard terminals
3. Provision for a private line network, thus the internal voice network is not affected.

H. Transmission options
1. Switched and/or leased telephone lines
2. Value added networks (Tymnet/Telenet)
3. Microwave
4. Satellites (SBS)

I. Value added network features
1. Error free transmission by performing error checking
2. Offer alternate routing
3. Provide security check for someone accessing your line
4. Conversation is documented
5. Provides international service
6. Keeps communication costs down

III. Communicating Word Processors (CWP)
A. Entered in the middle to latter part of the 1970's
B. Transmits whatever can be keyed at the word processing terminal
C. Communication is terminal to terminal
D. Protocols between and among terminals must be compatible otherwise 3rd party interface is required
1. Protocol translators
2. Software
3. Value added carriers
E. Terminals must have appropriate communications software and/or hardware
F. Communicating word processors will decline as standalone word processors are replaced with networked systems
G. Transmission options
1. Local area networks
2. Switched and/or leased telephone lines
3. Value added networks
4. Microwave
5. Satellites

IV. Computer-based message systems (CBMS)
A. Although the potential for CBMS has existed for years, serious consideration for these systems is related to the growth of executive workstations--late 1970's

B. Communication originates at a terminal and sent to a computer where message is stored in an "electronic" mailbox and then accessed via a terminal
C. CBMS's are software based
D. Computers function round the clock--messages can be transmitted anytime
E. Terminals must be compatible with the computer
F. Prime users of CBMS are those who have need to transmit limited amounts of information
G. Transmission options
   1. Hardwired
   2. Local area networks
   3. Switched and/or leased telephone lines
   4. Value added networks
   5. Microwave
   6. Satellite

V. Computer-based voice communications (CBVC)
A. Entered in the early 1980's
B. Communication is from telephone handset to a computer Voice is stored in digitized format in an "electronic" mailbox and then accessed via a telephone
C. CBVC systems require huge amounts of storage to convert voice to digitized format, e.g. a 200 word message requires 1,500 bytes of storage--a 200 word voice message requires 170 times that number of bytes (250,000)
D. Computers function round the clock--voice messages can be transmitted anytime
E. Messages can be sent from any telephone
F. Senders and receivers of CBVC system messages do not have to keyboard
G. Transmission options
   1. Broadband local area networks
   2. Voice grade telephone lines
   3. Value added networks
   4. Microwave
   5. Satellites
H. Partial list of Voice Messaging Companies
   1. GTE (Telemessger)
   2. Genesis Electronics Corp. (CINDI)
   3. IBM (Ads)
   4. Octel (Aspen)
   5. Northern Telecom (IVMS)
   6. Rohm (PhoneMail)
   7. Tel-Star
   8. Voice and Data systems
   9. Voicemail International
   10. Votan
   11. Wang (DVX)
   12. Xerox (XVMX)

VI. Comparison of electronic mail/message system categories
  A. The telephone
    1. Typically 28% of all phone calls are completed
    2. Phone calls average 6 to 9 minutes with 3 minutes wasted before conversation begins
  B. With facsimile and communicating word processing, documents are prepared in the traditional manner even though they are transmitted electronically
  C. Computer-based message systems and computer-based voice communications
    1. Save 30 minutes of wasted time per day for telephone calls
    2. Text/voice messages can be entered by managers
    3. Message sent by author directly to the recipient's electronic mailbox--unlike facsimile and communicating word processors where transmission is to a specific unit that may or may not be able to accept the transmission
    4. Each user assigned an electronic mailbox--information from CBMS system accessed via a display terminal or nondisplay keyboard with printer if hard copy is desired or from CBVC system via any telephone
    5. Eliminates telephone tag and telephone tyranny
  D. Genesis Electronic Corporation projects a company with 100 users would save $4,500 to $19,400 per month by using voice mail based on a reduction in length of calls, rates, number of calls, clerical and mailing costs, and personnel time

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Electronic Document Based Filing Systems

I. Electronic document based filing systems
   A. Differs from data base systems--complete documents are retained
   B. An ideal system includes all documents
      1. Whether the source is internal or external.
      2. Whatever the form--text, handwriting, voice, graphics, and/or pictures.
      3. With the search, retrieval, and storage associated with electronic speed and accuracy.
      4. Plus the capacity to replace the need for hardcopy.
      5. And is easy to use by all.

II. Document generation alternatives
   A. Electronic keyboarding of documents originating in-house
   B. Telecommunication for entering incoming documents into the electronic filing system from remote locations.
   C. Optical character reader (OCR) for entering incoming documents into the electronic filing system and for inputting documents generated in-house on non-electronic office systems
   D. Microfilming incoming documents and documents generated in-house on non-electronic office equipment
      1. Computer output microfilm (COM) for filming documents generated in-house.
      2. Computer input microfilm (CIM) for filming incoming documents for input to electronic filing system.
   E. Imaging of incoming documents via laser scanning devices that accept whatever is on the page--characters, signatures, pictures, charts, graphs. A page sized picture requires the same storage space as 10 pages of text.
      1. IBM Scanmaster and Wang's PIC (Professional Image Computer) are examples of imaging devices that store data on magnetic hard disks--documents can be revised/altered.
      2. CDC's LD1200, and KOM's Optfile are examples of optical digital disk systems where information is stored on noneraseable disks.

   NOTE: In A, B, and C above the electronic devices used are able to recognize individual characters--letters, numbers, and symbols. Thus, it is possible to search through documents using a key word or word string. D and E capture documents as images and document search techniques are dependent on the indexes created.

III. Document storage alternatives
   A. Magnetic media (e.g. disks/tapes)
      1. Computer-quick retrieval.
      2. Documents can be revised, deleted, moved.
      3. Standard WP/DP equipment used for storage, retrieval, and printing.
      4. Document storage is 5 cents per page ($20 per megabyte).
      5. Since information can be altered, this medium would not qualify stored documents for legal purposes.
   B. Microfiche/microfilm
      1. All types of documents easily stored whether picture, graphics, words, data.

2. Documents are in readable format and are recognized as legal alternatives to hardcopy.
3. Microfilm retrieval is slow when compared to other forms of media.
4. Special equipment is needed for viewing and imaging.
5. Document storage cost per page is .001 (1/10 of one cent--65 cents per megabyte of COM).

C. Optical digital disks
1. Computer-quick retrieval--1-2 seconds.
2. Once recorded, documents are "fixed" onto the media and on most systems cannot be altered--the automatic audit trail available on a write-once disk is the feature most likely to make it legally admissable in courts of law.
3. Special equipment required.
4. Storage cost per document is less than 2 cents per page ($5 per megabyte) and by 1990 is expected to drop to .002 (2/10's of one cent or $10 per gigabyte).

IV. Configuring alternative electronic filing systems
A. Computer assisted retrieval (CAR) with microfiche/microfilm as the storage medium (potential for COM)--computer used for indexing and document retrieval
B. Electronic keyboarding/imaging and OCR--documents retained on magnetic disks/tapes or optical digital disks
C. Electronic keyboarding/imaging and CIM--documents retained on magnetic disks/tapes or optical digital disks
D. Combination of CAR with B or C to eliminate hardcopy document storage and provide for high speed retrieval

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A Comparison of Optical Disk Technologies
for Office Automation Applications

I. Three Formats of Optical Storage Technology Using Disks
   A. Optical videodisc
   B. Optical digital (OD) data disk
   C. Compact disk (CD-ROM)

II. Need For Alternative Information Storage Systems*
   A. Ability to get information
   B. Faster access
   C. Retrieve only what is needed

III. Current Methods of Storing Information
   A. Books
   B. Reference manuals
   C. Microfiche/film
   D. Diskettes
   E. Magnetic tape
   F. Hard disk drives
   G. Hard copy (paper) systems

IV. Laser Technology Development
   A. Optical means that data is stored and retrieved with a laser
   B. Prime users of laser technology
      1. Space
      2. Surgery
      3. Manufacturing
      4. Automated office

V. Optical Storage Media
   A. Current available in 2 forms
      1. Disk
      2. Card
   B. Under development--optical tape

VI. Optical Storage Similarities
   A. Durable
   B. Consistent
   C. Error-free
   D. Random access
   E. High density storage
   F. Cost effective storage
   G. 25+ years life span

VII. Optical Disks Compared to Floppies and Hard Disks
   A. Floppy disks write data in circular tracks stacked 96 to the inch
   B. Hard disks - 800 tracks to the inch
   C. Optical disks - 40,000 tracks to the inch

* The paper made from the pulp of 27 fir trees is equivalent to the storage capacity of one double sided 12-inch optical disk.

A Comparison of Optical Disk Technologies
Page 2

VIII. Components of an Optical Disk System
- A. Input device
- B. Optical storage system
  1. Hardware
  2. Media
- C. Computer for system integration
- D. Output devices
  1. Screen
  2. Hardcopy (laser printer)

IX. Optical Videodisc
- A. Technology
  1. Master is "etched" on disc with a laser
  2. Duplicates made in unlimited quantities
  3. Silver coated, 8-inch or 12-inch discs
  4. Stores up to 54,000 unique analog images (photographs, slides, films, graphics, computer generated text)
  5. Data can be stored in digital as opposed to analog format--up to a gigabyte (1 billion characters) per disc side
  6. Two audio tracks
     a. Can be used separately for narratives
     b. Used together for stereophonic sound
  7. Images are projected onto a TV monitor
- B. Features
  1. One image can remain on a monitor while the narrative continues
  2. Graphics generated by the computer can be imposed on the video image--thus providing instructions, updated information, etc.
  3. A recent innovation allows the user to manipulate screen images
     a. Rotating
     b. Zooming in on a section
     c. Panning back and forth
- C. Sampling of optical videodisc applications
  1. Company orientation
  2. New product announcements for distribution to branches
  3. Catalogs of supplies, hardware, software
  4. In-house newsletters
  5. Training
     a. Product service--technicians
     b. Product marketing--sales
     c. Operation & applications--employees/customers

X. Optical Digital (OD) Data Disk
- A. Technology
  1. Digitized data is "burned" into disk's surface with a laser beam either as holes, bubbles, or alterations to the physical state of the disk coating
  2. Error detection methods used
     a. DRAW--Direct Read After Write; disk must make a full rotation to verify that data is correct
     b. DRDW--Direct Read During Write; the data is read as it is written; speeds up recording process as a full disk revolution is not required

3. Uses "WORM" technology--Write Once/Read Many times
4. Recording similar to existing magnetic media technology
   a. Sectors
   b. Tracks
5. A 5 1/4" optical disk stores between 100 Mb and 200 Mb per side while a 12-inch optical disk stores a gigabyte (1 billion characters)--equivalent to 500,000 sheets of paper per side or the data stored on 50 or more reels of tape
6. Used in conjunction with computer based systems hardware--e.g. workstations with keyboards and screens

B. Features
1. Storage density (10 times greater than magnetic media devices)
2. Stores text and images on one media
3. Rapid input (scans a page into the system in 2 seconds)
4. High speed random access
   a. Movement from one section of disk to another virtually instantaneous
   b. Laser beam reads data written 50 billionths of a second earlier--magnetic tape requires 2 different heads to read and write simultaneously
5. Cost effective storage/one megabyte on-line
   a. $5 optical digital disk
   b. $40 magnetic hard disk
   c. $150 conventional tape drive
6. Flexible applications
   a. Large document filing systems with high speed scanners and printers
   b. Individual optical disk drives attached to stand alone or networked

C. Sampling of optical digital disk applications
1. Permanent audit trail for financial transactions (except in forthcoming erasable disk systems)
2. Recordkeeping
   a. Warranty records
   b. Inventories
   c. Credit records for verification
3. Central file server for LANs (Local Area Networks)
4. Image storage and retrieval systems
   a. Engineering drawings
   b. X-rays
5. Electronic document storage
   a. Alternative to office files
   b. Archival records
   c. Fixed disk backup
6. Computer mass storage device for data bases

D. Examples of optical digital disk systems
1. LD1200--CDC (Control Data Corporation)
   a. Write/read system - $20,000
   b. DRDW recording technology
   c. 12-inch disk holds 1 gigabyte per side and costs $500--disk must be turned over to read side 2
   d. You can add to disk until it is full
   e. Index can be placed on the disk

f. Laser scanned image and/or information stored is transmitted digitally to the system--thus system stores voice, data, words, image and video information
g. Interfaces with IBM PC--takes up one slot

2. Optfile--KOM
a. Write/read system - $18,500
b. DRAW recording technology
c. 12-inch disk holds 1 gigabyte per side and costs $375--must be turned over to read side 2
d. Write activity doesn't have to be completed all at once
e. Index can be placed on the disk
f. Company writes software for interfacing optical digital disk systems--theirs and others--with computer systems

XI. Compact Disk/Read Only Memory (CD/ROM)
A. Technology
1. Master is "embedded" on disk with a laser
2. Duplicates made in unlimited quantities
3. Disk dimension is 4.72 inch diameter
4. Released in US in 1983 as an audio device
5. In addition to the audio storage the CD stores digital text, graphics, and video images--black & white or color
6. Stores 550 megabytes (550 million characters) of digitized data

B. Features
1. Extraordinary high density
2. Small size
3. Ability to store in 3 formats
a. Video--see
b. Text/image--read
c. Audio--hear
4. Potential use for distributed/decentralized office applications

C. Sampling of compact disk applications
1. Will impact office automation applications
2. Mass distribution of application and operating system software
3. Mass distribution of data bases
4. Individual manipulation of data or application software
5. Data search functions

D. Example of CD/ROM characteristics on the DEC (Digital Equipment Corporation) CD reader
1. Desktop unit--12" x 10" x 4"
2. Supported by DEC's MicroVAX I, MicroVAX II or VAXstation II under the MicroVMS operating system
3. CD/ROM disks are removable
4. A one-second average access time
5. 150,000 bps (bits) data transfer rate between reader and host computer
6. Initial cost for replicated data is $100 to $200 per disk (depends on volume) and prices will drop
7. The DEC CD reader cost is $2,200-- eventually price will be comparable to current cost ($600) of a 5 1/4" Winchester disk drive--CD reader cost expected to drop by 75%
8. Disk capacity 600,000,000 bytes of formatted data--text and/or graphics--equivalent to:

a. 3-4 encyclopedias, or
b. 250,000 single typed pages, or
c. 1,600 conventional 5 1/4" floppy disks, or
d. 1,000 fiche cards, or
e. 50 times as much as 10 Mb hard disks, or
f. 46 days of data transmitted at 1200 baud over telecommunication lines

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The Office in the Year 2000

I. All those working in offices will have display terminals with multi-function capabilities (voice, data, word image, and video processing activities) at their fingertips.

II. Any incoming correspondence that is not transmitted electronically will be converted to a digitized format via laser scanners and input into the electronic filing system. The documents will then be accessed via display terminals for action.

III. Documents created in-house will be dictated to the voice actuated display terminal.
   A. Words will appear on the individual's terminal display for editing and revision by the author or support staff member.
   B. Words will be run through a dictionary and a grammar/syntax validator before the final draft is ready for distribution.
   C. Documents will be sent via electronic mail anywhere in the world.
   D. Duplicate copies will be automatically filed in the optical disk storage system.

IV. All mail and messages (to include voice mail) will be stored in "electronic mailboxes" that individuals can access at any time.

V. Voice communications will be conducted via the display terminals.
   A. The receiver can identify the caller and the purpose of the call.
   B. The receiver decides whether to talk or to take a message by pushing a few buttons.

VI. Business trips will become less necessary through full-motion video teleconferencing in two, three, or a dozen locations.

VII. While businesses will maintain a headquarters office complex for central control, more office work will be done by work group clusters in distributed office complexes in outlying areas that are specially wired and outfitted.

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